

NENA

The 9-1-1 Association

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Ms. Marlene H. Dortch, *Secretary*
Federal Communications Commission
445 12th Street SW
Washington, D.C. 20554

November 15, 2019

In re Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems. PS Docket No. 07-114.

Dear Ms. Dortch:

NENA: The 9-1-1 Association first wishes to thank the Commission for its hard work on the upcoming Report & Order and Fifth Further Notice of Proposed Rulemaking in the above-mentioned proceeding. Second, we would like to express thoughts regarding the Commission's upcoming vote on its proposed "Z-axis" location accuracy metrics. We emphasize in this letter that (1) NENA supports the proposed $\pm 3\text{m}$ Z-axis location accuracy metric; (2) while NENA supports improvements to location accuracy including the optional delivery of floor-level information as it is available, CMRS providers should be required to deliver, at a minimum, unaltered elevation in Height Above Ellipsoid (HAE); and (3) the Commission should consider test data, real-world call data, and the realities of vertical location technology deployment in its assessment of nationwide CMRS providers' z-axis compliance.

NENA supports the Commission's proposed z-axis metrics

As an initial matter, NENA (along with the vast majority of organizations representing public safety) supports the Commission's proposed z-axis metrics for 2021 and 2023. As noted in our previous filings, $\pm 3\text{m}$ is necessary to meet the needs of public safety.

OSPs should, by default, convey location in terms of HAE — the universal, global, interoperable reference frame for elevation.

Google has proposed vertical accuracy location requirements that permit CMRS providers to pass a floor level in lieu of a HAE estimation.¹ While we appreciate Google's commitment to public safety and substantial innovations in 9-1-1, we must disagree with this proposal. A handset's location, including z-axis, must be delivered to the 9-1-1 system *in its original format*. Google's proposal — to the extent it removes z-axis HAE from the location payload — would reduce overall vertical location accuracy and upend the marketplace for downstream mapping and location solutions, disrupting many of the benefits of a ubiquitous standard for vertical elevation measurement.

Because HAE is the native frame of reference for GPS devices and smartphones, resolution is lost when calculating AGL from HAE (and vice versa). HAE provides a very precise output for each given input because it is a shape based on a mathematical equation. Because of this, it is immune to the foibles of human surveying techniques and the transience of terrain shapes — especially those in tectonically active regions like the Pacific coast. These regional idiosyncrasies exist domestically as well as internationally. While more accurate local and regional maps exist, unifying these maps is prohibitively cumbersome, and the most accurate nationwide elevation model NENA found freely

¹ See Letter from Megan Anne Stull, Counsel to Google LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission, PS Docket 07-114 (Nov. 8, 2019) (urging the Commission to permit the provision of floor label data within a range of one floor above or below the location of the wireless callers to E911).

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available had a resolution of 1m.² While a loss in resolution of 1m is relatively benign, over the course of multiple translations and measurements against varying terrain datasets, this discrepancy can grow substantially. Further, there is no reason for a CMRS provider to estimate AGL according to whatever method it chooses and replace the expression of height as HAE, when the 9-1-1 system could do the same thing while still retaining the handset's original location information. While the 9-1-1 system could take a 3-dimensional location with height expressed as AGL and convert it back to HAE to use to query other systems, it will have lost some precision for no good reason.

HAE's ubiquity also serves the location marketplace. It is well known that WGS84 is used as the *global* reference for GPS. Nearly every consumer GPS device manufactured in the world³ (barring a small subset of equipment generally used only in China and by the armed forces of Pakistan)⁴ makes use of WGS84; it is close to the only "seamlessly interoperable" thing we have in public safety. It is also the reference for the z-axis measurement provided from location services by the handset.⁵ The presumption that location expressed for 9-1-1 is always in three dimensions provides an opportunity and incentive for 3-dimensional datasets to use this location (much as the presumption that x/y coordinates are always expressed for 9-1-1 provides opportunity and incentive for conventional 2D maps for 9-1-1). Preserving the integrity and usability of HAE downstream of the OSP creates powerful incentives for mapping innovators and public safety to make location information more powerful than ever.

Calculating AGL from HAE is a common and low-cost process, but should be performed as close to the PSAP as possible.

It is relatively trivial to calculate AGL for a given height expressed in HAE. This may be done by the 9-1-1 system's mapping services. Some free or low-cost, off-the-shelf options include web services provided by Google,⁶ Jawg Maps,⁷ Microsoft,⁸ and Esri,⁹ notwithstanding any built-in functionality included in end-user software already deployed in the PSAP.¹⁰ Additionally, the U.S. government provides high-quality elevation data free of charge,¹¹ and NENA found an open-source solution to assist any entity in provisioning their own AGL service.¹² This ease of conversion, combined with the fact that the most accurate mapping is often the most local, public safety organizations and their providers should have the flexibility to choose the best provider for a given use case.¹³ While NENA does not oppose the OSP or

² <https://catalog.data.gov/dataset/usgs-national-elevation-dataset-ned-1-meter-downloadable-data-collection-from-the-national-map>

³ Though general information on how GPS works is available through many sources, see, e.g., <https://www.gpsworld.com/data-collection-of-wgs-84-information-or-is-it/>.

⁴ Neither of these implementations represent interoperability issues NENA is particularly worried about at this time, particularly in the United States. See general information on the BeiDou satellite constellation and cited materials on Wikipedia, <https://en.wikipedia.org/wiki/BeiDou>.

⁵ Specifically, Google ELS (<https://ecfsapi.fcc.gov/file/1109433015344/2019-11-08%20Google%20Ex%20Parte.pdf>) and Apple HELO. NENA does not mean to endorse Apple or Google and provides this only for reference. (https://cdn.ymaws.com/www.nena.org/resource/resmgr/docs/Apples_Enhanced_Emergency_Data.pdf).

⁶ <https://developers.google.com/maps/documentation/elevation/start>

⁷ <https://www.jawg.io/docs/apidocs/elevation/>

⁸ <https://docs.microsoft.com/en-us/bingmaps/rest-services/elevations/get-elevations>

⁹ <https://developers.arcgis.com/rest/elevation/api-reference/get-started-with-elevation-services.htm>

¹⁰ For example, RapidDeploy Computer Aided Dispatch software uses Esri's mapping service, which is easily capable of making an AGL calculation. The software also allows the PSAP to use their own GIS. <https://www.rapiddeploy.com/radius>. No endorsement meant or implied.

¹¹ <https://www.usgs.gov/news/new-elevation-map-service-available-usgs-3d-elevation-program>

¹² <https://github.com/Coinio/Elevation-API>

¹³ NENA notes that all of the examples provided generally require or assume as the default input coordinates expressed relative to the WGS84 ellipsoid, with the notable exception of reference data provided by the United States Geological Survey (USGS), which appropriately uses a datum most appropriate for North America (NAD83 and NAVD88). However, as NENA has

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another entity estimating and delivering additional information to the 9-1-1 system, we urge the Commission not to give regulatory clearance to alter or remove information such as a device's estimated HAE.

Operationalizing HAE is not unrealistic.

Lastly, NENA notes that HAE measurements, surfaced directly to a public safety user, have some very clear use cases. For example, a responder arriving on scene to a fire in Denver can see from a glance at her smartwatch that the 9-1-1 call was placed at a location about 13.37m above her. That doesn't require AGL, AMSL, or even terrain maps, or any knowledge that the caller is located at 5500' above sea level. After all, the field responder knows that she is standing on the ground, is probably capable of basic subtraction, and can serve as the reference point to operationalize HAE. In the future, a more comprehensive situational awareness solution may perform this calculation automatically.

The Commission must consider deployment realities, Test Bed results, and call outcomes when evaluating compliance with the rules, especially with respect to enforcement.

NENA notes that at present, Google has submitted its Emergency Location Service (ELS) for testing in the Test Bed,¹⁴ which may provide informative outcomes by demonstrating the viability (or lack thereof) of mobile location services when used for vertical positioning with making 9-1-1 calls. NENA notes the Google has advised the Commission to phase in a less stringent requirement than $\pm 3\text{m}$ for 80% of calls¹⁵ and more recently a z-axis measurement *or* floor level.¹⁶ NENA also notes that these test results will not be published until after the Commission's order is made, and represent a significant information gap with respect for providing the first Test Bed results for a service presently used by the public for 9-1-1 purposes.¹⁷

Considering these factors, the Commission should carefully evaluate Test Bed and real-world call data when evaluating compliance with the rules. The Commission proposes a target of $\pm 3\text{m}$ for 80% of calls; NENA strongly supports this target.¹⁸ However, Test Bed data, as well as that data captured in the real world, may force the Commission and stakeholders to evaluate complicated scenarios by April 2021, such as:

1. A method used to measure z-axis location well exceeds the proposed metric in some markets, but greatly underserves other markets
2. A method used to measure z-axis location well exceeds the Commission's metric in all markets, but is wildly inaccurate often enough for first responders to ultimately have little to no faith in the z-axis measurement
3. A method used to measure z-axis location falls short of the Commission's metric, but by a small margin, and shows signs of improving to eventually meet the Commission's metric
4. A viable solution for z-axis location or dispatchable location is suddenly and unceremoniously removed from the market with little to no notice to the parties that depend upon it

NENA cautions the Commission that measuring compliance and taking enforcement action will require nuance and careful consideration. As noted by Apple, "location for mobile devices is inherently probabilistic and can accurately

demonstrated, location provided by the handset can be easily translated to be compatible with the USGS dataset and should be accurate so long as the handset's originally determined location is left intact.

¹⁴ See <https://ecfsapi.fcc.gov/file/100989248298/191009%20CTIA%20911%20Loc%20Accy%20Ex%20Parte.pdf>

¹⁵ See [https://ecfsapi.fcc.gov/file/10520307306966/2019-05-20%20Google%20Z-Axis%20Comments%20\(PS%207-114\).pdf](https://ecfsapi.fcc.gov/file/10520307306966/2019-05-20%20Google%20Z-Axis%20Comments%20(PS%207-114).pdf)

¹⁶ <https://ecfsapi.fcc.gov/file/1109433015344/ATTACHMENT%20--%20ELS%20PRESENTATION.pdf>

¹⁷ Google has noted to the Commission that its ELS service already serves over 2.5M emergency calls per day; see <https://ecfsapi.fcc.gov/file/1109433015344/ATTACHMENT%20--%20ELS%20PRESENTATION.pdf>. NENA respectfully notes that Apple provides an equivalent service for its devices, but has not submitted its service for evaluation through the Test Bed.

¹⁸ As NENA has previously asserted; see, e.g., <https://www.nena.org/news/476299/NENA-Comments-on-Z-Axis-Report--Order-and-Further-Notice-of-Proposed-Rulemaking.htm>.

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be represented only with clear and non-zero uncertainties.”¹⁹ Determining compliance and appropriate enforcement may require careful consideration of all factors, including mitigating factors for a solution that may not exactly meet the ordered metric as well as complicating factors for a solution that may not meet the ordered metric but is not particularly useful for actual first response.

NENA again thanks the Commission its hard work on this proceeding, for its support of 9-1-1 and public safety, and for this opportunity to comment.

Sincerely,

/s/ _____

Daniel Henry
Director of Government Affairs

/s/ _____

Brandon Abley
Director of Technical Issues

¹⁹ See [https://ecfsapi.fcc.gov/file/11131020725711/Apple%20z-axis%20ex%20parte%20\(2019-11-12\).pdf](https://ecfsapi.fcc.gov/file/11131020725711/Apple%20z-axis%20ex%20parte%20(2019-11-12).pdf)